



SHIPBOARD ELECTRONIC WARFARE

The Surface Electronic Warfare Systems Branch (SEWS) of the Naval Research Laboratory (NRL) conducts research and development of Electronic Warfare (EW) systems directed toward the protection of Navy ships. The Branch mission includes the development of EW system and subsystem requirements; development, analysis and evaluation of shipboard ECM systems, subsystems with and components; threat assessments; and development of EW operational tactics and concepts.

The Surface EW Systems Branch is interested in receiving proposals for research and development into all of its mission areas. Specific areas of interest include, but are not limited to:

1) Signal Detection and Processing

The trend in threat emitter characteristics is toward lower power emitters with highly agile parameters, including pulse to pulse frequency variation and random or semi random pulse repetition frequency (PRF). These emitter characteristics may include parameter variations using identifiable sequences or random parameter variations. EW systems must be able to detect, de-interleave, sort, and measure intra-pulse and pulse-train parameters to classify and associate EA techniques with these agile emitters in a dense electromagnetic (EM) environment. Key research areas include:

- a) Detection and direction finding of LPI signals in a complex EM environment, including associated microwave receiver, antenna component, and system technologies that provide wide bandwidth and high sensitivity.
- b) Sorting and deinterleaving of frequency and PRI agile emitters in a complex EM environment.
- c) Pulse-to-pulse feature extraction for real time signal processing.
- d) Pulse and emitter measurements and derived pulse train measurements that provide parameters to improve emitter classification with minimal ambiguities.

2) Electronic Attack (EA) Technique Generation

Countering advanced threat systems will require innovative conventional and non-conventional ECM techniques and EA technique generators for application in all phases of the battle timeline including surveillance, targeting, acquisition, and terminal phases.

In addition countering advanced threats requires a coherent technique generation which includes the ability to capture, store, and process threat pulses received in a complex EM environment. Key research areas include:

- a) Broadband, high dynamic range Digital Radio Frequency Memories (DRFMs).
- b) Finite Impulse Response (FIR) Filters.
- c) ECM techniques against Low Probability of Intercept (LPI) radars.
- d) Counter-targeting ECM techniques systems for battle force defense.

3) Advanced ECM transmitters

Increased threat capability and increasing threat density will require the development of new transmitter technology with expanded frequency coverage and multiple threat handling capability. Key research areas include:

- a) Millimeter-wave EW transmitter concepts and technologies.
- b) Broadband, multiple-simultaneous-beam antenna technology.
- c) Multifunction aperture designs and technology.
- d) Very wideband electronic countermeasures (ECM) technologies and components, including amplifiers (tubes, solid state, and hybrids), power combiners, filters, and other discrete devices.

4) Effectiveness Assessment & Sensor Integration

Future EW systems will need to operate in a distributed, networked environment in order to provide effective capability against advanced threats in complex EM environment. Key research areas include:

- a) Shipboard sensor fusion techniques;
- b) Intra-ship information fusion/association techniques;
- c) Timely/near real-time EW effectiveness measurement technology.
- d) Distributed, networked battle force concepts, techniques and systems.

5) System Concept Development

Effective countermeasures against advanced threats will require integration of signal detection and process technologies, EA Technique Generation technologies, Advanced ECM transmitter technologies, and Effectiveness Assessment & Sensor Integration technologies. Key research areas include:

- a) Small ship/boat EW systems or subsystems.
- b) Shipboard EW system modular integration concepts.

NRL more favorably will consider proposals offering initial increments comprised of short-term studies (6-8man-months) which then can be used to decide if the research deserves further investment.

Address initial proposals to Code 5740, Naval Research Laboratory, 4555 Overlook Ave, SW., Washington, DC 20375; or [e-mail](#); or telephone at (202) 404-3739. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.